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Trust and Influence

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2013 AFOSR SPRING REVIEW

NAME: Trust and Influence

BRIEF DESCRIPTION OF PORTFOLIO:

Basic research to explore the science of reliance (i.e., how humans establish, maintain, and repair trust of humans and technological systems) and the science of influence (i.e., understanding how to shape the behavior or attitudes of others).

LIST SUB-AREAS IN PORTFOLIO:

Science of Reliance

- Trust in Autonomous Systems/Autonomy – identify the factors that shape reliance in complex human-machine interactions
- Cross-Cultural Trust – identify the antecedents of trust in different cultures

Science of Influence

- Understanding the behavioral effects of different influence tactics (air strikes, messaging, developmental activities)
- Understanding the cognitive mechanisms that drive influence effects – identify the avenues of influence for different cultural groups

Trust Background

Trust = willingness of individuals to accept vulnerabilities from the actions of others with little ability to monitor their actions (Mayer et al., 1995)

Assumptions:

- Trust as a human phenomenon
- Trust & trustworthiness are independent (Mayer et al., 1995)
  - Ability, benevolence, & integrity
- Trust is relational
  - Cross-cultural interactions
  - Human-machine interactions
- Trust is dynamic (Levine et al., 2006)
- Trust leads to reliance behavior (Lee & See, 2004; Mayer & Gavin, 2005)

Motivation – Trust

AF Tech Horizon's 2010
"In the near to mid-term, developing methods for establishing 'certifiable trust in autonomous systems' is the single greatest technological barrier that must be overcome to obtain the capability advantages that are achievable by increasing use of autonomous systems" (p. 42)

Operational Challenges:

- Future battle ground - complex human-machine interactions
  - More supervisory control, teaming – increases need for appropriate trust
- Interactions with other cultural groups – where trust will be critical as HUMINT increases in value – partner capacity service core function (Schwartz, 2011)

Science Challenges: Appropriate reliance is really hard!

- Automation often has unintended consequences (Parasuraman & Riley, 1997)
  - Automation paradox – reliable automation can lead to catastrophic error
- Humans have trust biases (Lyons & Stokes, 2012)
- Little is known about how human trust principles apply to autonomy/robotics
- Interpersonal trust models are based on "Western" data/models

Opportunities:

- Identify human-centric trust principles before fielding autonomous systems
- Support AFCLC cultural competencies – trust building

Trust Domain/Scope

Cross-Cultural Trust

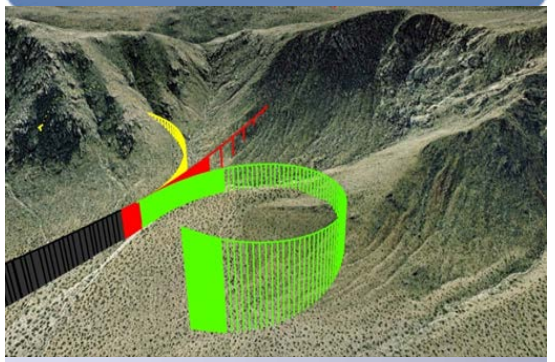
Trust in Automation

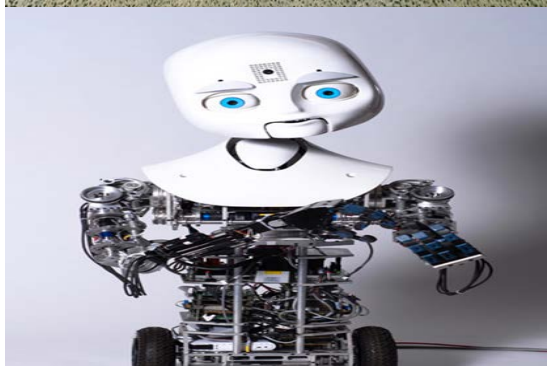
Trustworthiness
- **Ability**
- **Benevolence**
- **Integrity**

Human-Machine Interactions

Social Design

Autonomous Systems & Automation





Pak – Anthropomorphic Design

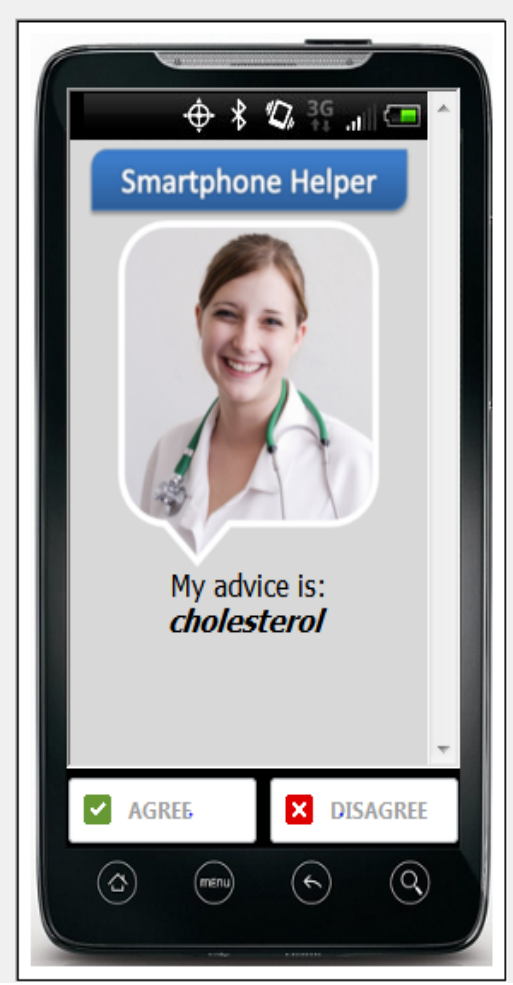
PI: Richard Pak (Clemson University)

<u>Objective</u>: Evaluate the impact anthropomorphic aids on trust (age, gender, reliability)

- **Prior research found anthropomorphic aid increased trust for younger adults, but improved performance for older and younger adults (Pak et al., 2012)**
- **Gender stereotypes apply to computer agents (Lee, 2003)**

<u>Approach</u>: Manipulate gender, age, and reliability (45%, 70%, 95%) of an agent during a difficult medically-related problem.

- **Current sample is Younger sample only**



Pak – Anthropomorphic Interface

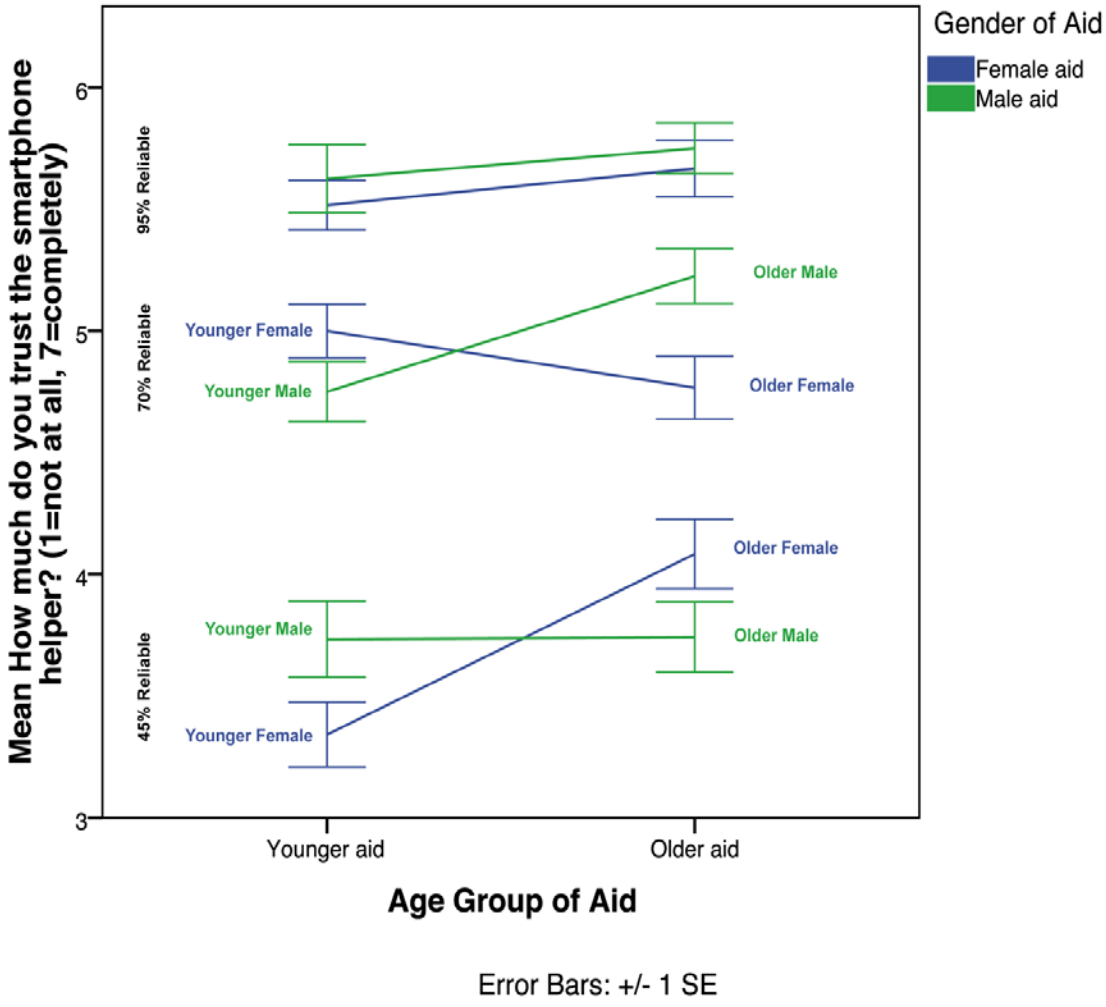
Results: Significant 3-way interaction:
$F(1,1440) = 3.84$, $p < .05$

High reliability (95%): no differences

Moderate reliability (70%): Older male

Low reliability (45%): Older female

- **Medicine can be stereotyped as an older male profession (Singer, 1986) – operates at moderate reliability**
- **Nurturing stereotypes may operate at lower reliability**



Mayer – Cross-Cultural Trust

PI: Roger Mayer (North Carolina State University)

<u>Objective</u>: Conduct cross-cultural experiment to test (Mayer et al. 1995) model in several different countries – will be the most expansive cross-cultural test of this model to date!

- **Broad support for the model in western context (Colquitt et al., 2007)**
- **Some evidence that benevolence is favored by collectivist culture (Branzei et al., 2007)**

<u>Approach</u>: conduct vignette-based experiment manipulating ability, benevolence, and integrity – will examine relative impact of positive and negative trustworthiness on trust perceptions

- **Different social roles: supervisor, subordinate, and peers**
- **Countries: Singapore, Malaysia, Vietnam, Poland, Germany, Hungary, Lithuania, Turkey, Ethiopia, Uganda, Kenya, Rwanda, South Sudan**

<u>Results:</u> Grant is just getting started

Motivation – Influence

Lt Gen Flynn (Nov 2011)
Need to understand the "Precursors of war" – what are the triggers for attitudes and behavior in different parts of the world

Operational Challenges:

- ACC request to AFRL: Provide research to evaluate the "higher order/long-term effects of air/space/and cyber operations" (Provancha & Robie, 2011)
- Future of targeting = appropriate blend of kinetic/non-kinetic options
- Desire for greater role in phase 0 – shaping deterrence, persuasion
- LtGen Rew, ACC/CV (2011) – understand cultural "Influence levers"

Science Challenges:

- Manipulation of influence tactics not plausible in practice
- Rational actor models can backfire (Atran et al., 2007; 2012)
- Data mining and modeling tools have outpaced theory in social media research

Opportunities:

- Revolutionize "targeting" within the AF – quantify hidden costs
- Support AFSOC/ACC need for cultural awareness (e.g., AFRICOM)

Influence Domain/Scope

ALJAZEERA

Gratch – Emotions and Morally-Charged Negotiations

PI: Jonathan Gratch & Morteza Dehghani (USC ICT)

<u>Objective</u>: Examine the role of sacred values & emotions in negotiation

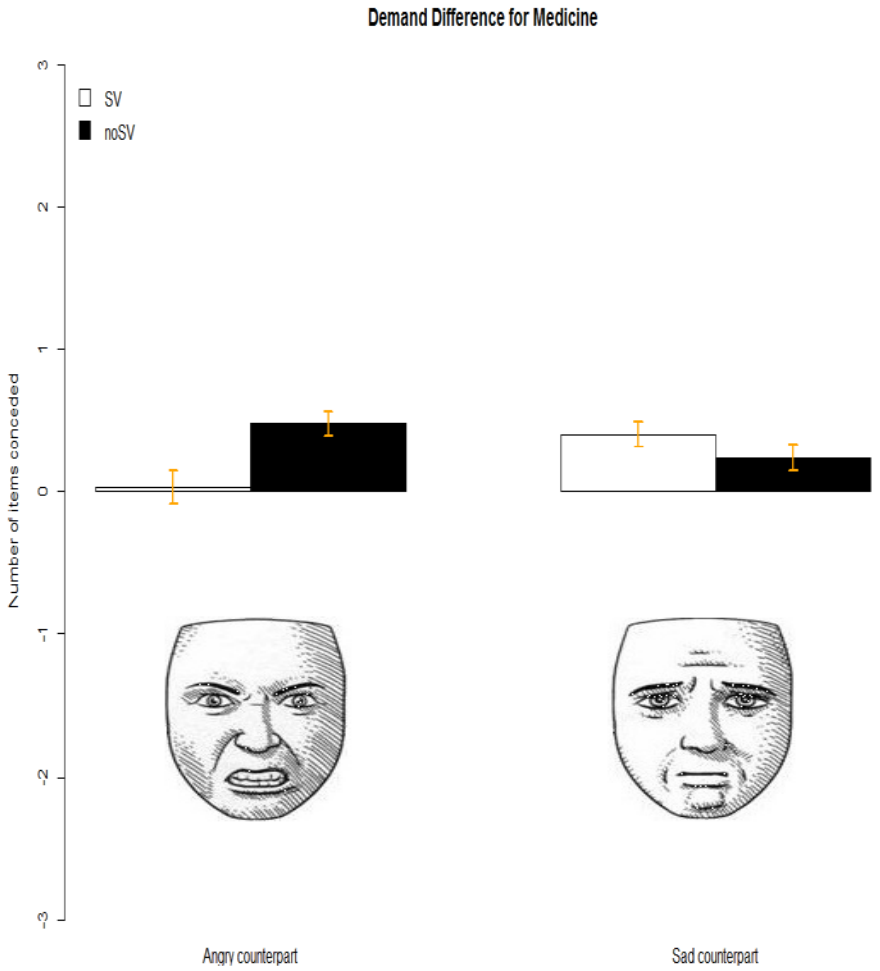
- **Different emotional expressions may trigger different socio-moral concerns (Keltner & Haidt, 1999)**
- **Looked at expressed anger & sadness**

<u>Approach</u>: Used sacred objects negotiation task (N = 332)

- **Emergency scenario (medicine critical)**
- **Beliefs about medicine assessed**
  - **Coded as SV or non-SV**
- **Agent programmed to simulate resistance to concessions**

<u>Results</u>: Expressed emotion interacted with sacred value belief

- **Non-SV gave more following anger**
- **SV gave more following sadness**



(Dehghani, Carnevale, & Gratch, 2012)

Shapiro – Poverty and Support for Violence

PI: Shapiro (Princeton) **(Blair, Fair, Malhotra, & Shapiro, in press, American J. of Political Science)**

Objective: Examine link between poverty and support for violence

- **Many policies target economic development – reduce poverty**

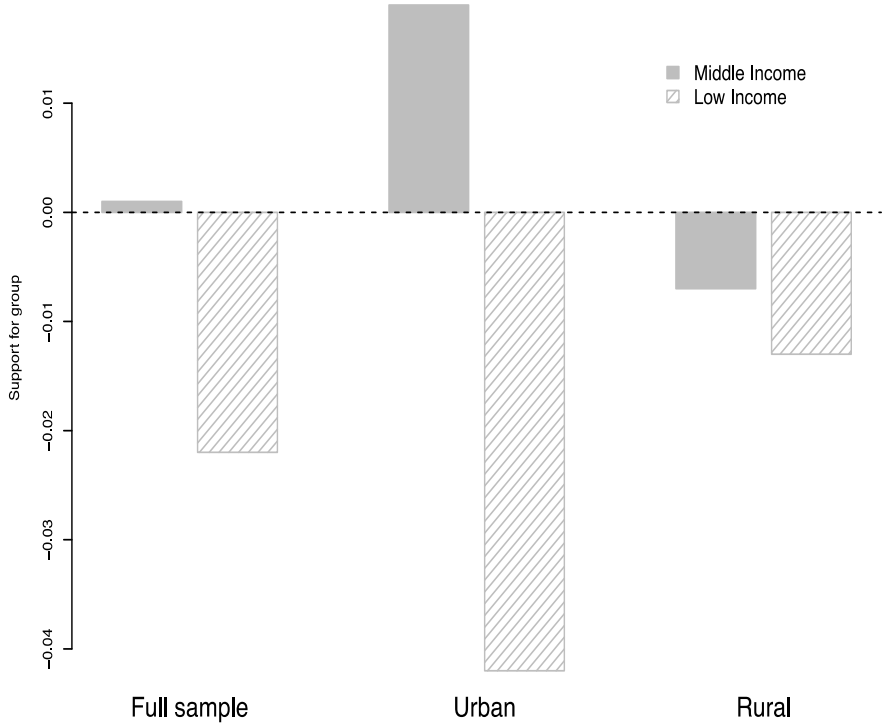
Approach: national survey in Pakistan (N=6000) – using endorsement methods

- **Random assignment to control vs treatment – 4 groups (e.g.,Taliban)**
- **Difference = support**
- **Many controlled variables**

Results: Poor have more negative views of militant groups

- **Stronger effect for urban poor**
- **Stronger effect for highly violent areas**

Treatment Effects by Income and Strata



Lyall – Effects of Civilian Casualties on Attitudes

PI: Lyall (Yale)

<u>Objective</u>: To examine the effects of violence on attitudes – uniform or conditional?

- **Support from locals critical to COIN (Kilcullen, 2009)**
- **Effects of violence toward civilians may depend on who inflicted the harm**

<u>Approach</u>: Used endorsement experiments in 204 villages in Afghanistan

<u>Results</u>: Victimization by ISAF and Taliban have asymmetrical effects on attitudes!

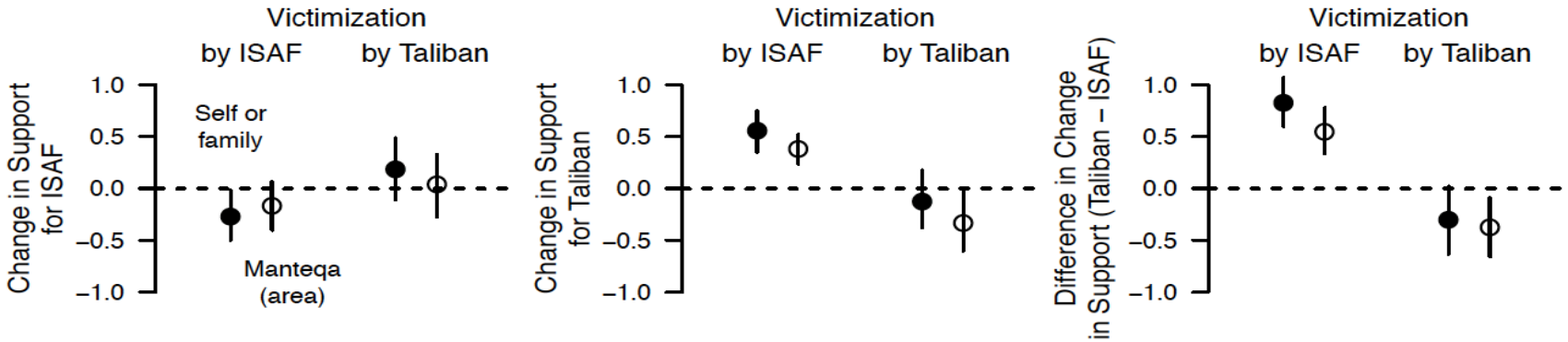


Figure 5: Estimated Effects of ISAF and Taliban Victimization on Support Levels for Each Combatant. The right panel presents the differences between the results in the middle and left panels. Posterior means of coefficients derived from multilevel models are plotted with 95% confidence intervals.

(Blair, Imai, & Lyall, 2012)

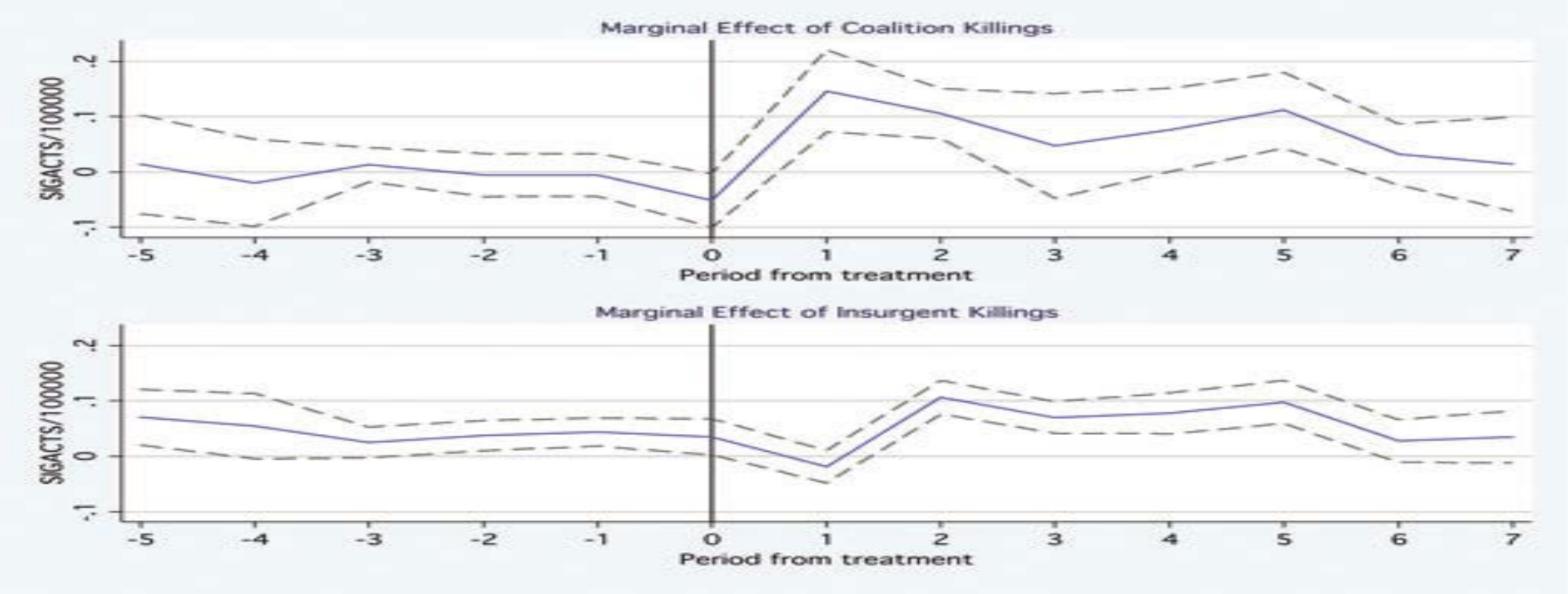
Shapiro – Effects of Civilian Casualties on Violence

PI: Shapiro (Princeton) **(Shapiro & Condra, 2012, American J. of Political Science)**

Objective: To examine the effects of civilian casualties on violence in Iraq

Approach: Modeled violence based on weekly-time series data - 104 Districts

- **Iraq Body Count – coded as coalition killings, insurgent killing, sectarian**
- **SIGACTS used as DV**



Gelfand & Nau – Culture and Contagion of Conflict

PI: Michele Gelfand & Dana Nau (UMD)

<u>Objective</u>: Examine the factors that drive the spread of conflict within, between groups overtime

- **In/Out group processes – depersonalization of individuals within and between groups**
  - **May spawn retaliation for harms against one's in-group**
  - **May set up all out-group members as potential targets**
- **Transgenerational processes – belief that one's in-group transcends past and future generations**
  - **May pass retaliation debt onto future generations, or spawn sacrificial behavior to save future honor**
- **Collectivism – retaliation as an obligation, social norm, act to save honor – given strong social norms of collectivists**

<u>Approach</u>: Combination of interviews, experiments, and computational modeling of conflict contagion

Culture and Contagion of Conflict

Findings: Honor conflicts spread more across networks in collectivistic cultures
(Gelfand et al, 2012; *Phil. Transactions of the Royal Society B*)

Is your honor linked to others? Who?
N = 182, Middle East and US

"Everyone that is connected to me concerns me…the individual affects the family and the family affects the whole country" (Jordan)

"If my friend [lost honor], my rage will erupt and I will avenge from the person who caused this… These are red lines not only for me but for everyone else as I assume in my country" (Lebanon)

"Here the issue of honor is such that when one Muslim's honor is harmed then it becomes an issue of all Muslim's honor" (Pakistan)

Country	Social Index
Jordan	11.67
Iraq	10.14
Egypt	8.25
Pakistan	7.64
Lebanon	6.17
UAE	5.71
Turkey	4.31
US	3.34

Lab Tasks

- **RH (Human Effectiveness Directorate)**
  - **Stokes – Dynamic Trust Model**
  - **Sutton – Avenues of Influence Cross-Cultural Implications**
  - **Young – Cultural Categories & Exemplars**
  - **Lochtefeld/Bowden – Whole Body Motion-based Deception**
  - ***Vickery – Modeling Effects of Directed Energy Weapons***
  - ***Calhoun/Funke – Trust Calibration: Effects of Fatigue***
  - ***Barelka – Trust Heuristics: Effects of Stress (Joint with Dr. Herklotz)***

- **RI (Information Directorate)**
  - **Salerno – Societal/Effects Modeling (NOEM Tool)**

- **RW (Munitions Directorate)**
  - ***Pasiliao – Trust within Wide Area Search Munitions (WASM)***

(New projects are in italics)

Recent Transitions

- Salerno LRIR – transitioned NEOM tool to Air Force Targeting Center
  - Aid in understanding impact of kinetic operations on infrastructure
- Research report requests from CENTCOM and USSOCOM
  - Interest in influence research, AFRICOM domain, effects research
  - USSOCOM collaborator on grant looking at the African Sahel region
    - Mali and Nigeria
- Minerva Research transitioned to
  - USAID – development planning and analysis
  - USSOCOM Director of Strategy Planning and Policy (J5)
  - DoD Counter Insurgency Board
- Axelrod grant – case-based influence
  - Supported USCYBERCOM threat analysis
- ARTIS grants – White House RFI on Middle East

Synergies

Trust

NRL: Trust in culture & humanoid robotics
ARL: Trust work related to interfaces, agents, networks
ARI: Trust in networked teams
NAVAIR: Trust & culture interests
IARPA: Funding large trust initiative on physiology of trust
ONR: Machine Ethics
NASA Dryden: Trust in automation – Automatic Collision Avoidance System
AFRL: Trust is a core research area – close collaboration with 6.1 and 6.2

Influence

ONR: Biology of sacred values, social media
DARPA: Interest in culture but more focused on neuroscience and training
OSD HSCB: Modeling, ops analysis, training (mainly 6.2-6.3)
Dept. of State: Social Media interests
DHS: Interest in data analytics – focus is domestic
Air University Culture & Language Center: Cross-cultural Competencies
Defense Equal Opportunity Management Institute: focused on cultural training

Program Trends

- Trust in Autonomous Systems
  - Social Cues in Human-like Robotic Interactions BRI
- Cross-cultural Trust
- Influence effects
  - Psychological/Behavioral Effects of Novel Weaponry BRI
- Cognitive mechanisms for influence
  - Socio-digital Influence BRI
- Computational Social Science

Thanks!

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